**ISOTOPES AND ATOMIC MASS**

Open the Isotopes and Atomic Mass simulation <http://phet.colorado.edu/en/simulation/isotopes-and-atomic-mass>

Play with the “Make Isotopes” tab of the simulation for a few minutes and then answer the following questions.

1. What particles determine the mass number?
2. Why is mass number always a whole number?
3. One isotope of carbon (C) has exactly the same mass number and atomic mass since it was used as the definition of the atomic mass unit (amu). Which isotope is it and what is its atomic mass?
4. What is the approximate mass of one proton? \_\_\_\_\_\_\_\_\_\_amu
5. What is the approximate mass of one neutron? \_\_\_\_\_\_\_\_\_\_amu
6. Look at 3 or 4 other atoms using the simulation. Do any of them have a whole number for atomic mass?

7. In the table below, list all the isotopes of carbon (C) that you can make with the sim.

|  |  |  |  |
| --- | --- | --- | --- |
| **Carbon isotope** | **Number of protons** | **Number of neutrons** | **Stable or unstable** |
| Carbon-12 |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

8. As you move to the right of the periodic table, do the elements get bigger or smaller?

9. As you move to the bottom of the periodic table, do the elements get bigger or smaller?

10. What seems to make the isotopes become unstable?

11. OPEN THE ABUNDANCE IN NATURE TAB. What happens to the abundance when you make an unstable isotope?

12. What does this mean?

13. How would you explain isotopes to a 5th grader?

(You had this question last week…Let’s see how your answers change!)**BONUS POINTS: Mix Isotopes**

1. Lithium has only two stable isotopes. Use the sim to determine the following:
   1. Atomic mass of lithium-6 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_amu
   2. Atomic mass of lithium-7 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_amu
   3. Average atomic mass of a sample containing three lithium-6 atoms and two lithium-7 atoms. \_\_\_\_\_\_\_\_\_\_\_\_\_\_amu
   4. Is the average atomic mass you just determined closer to the mass of lithium-6 or lithium-7? Explain
2. Describe a method to calculate the average atomic mass of the sample in the previous question using only the atomic masses of lithium-6 and lithium-7 without using the simulation.
3. Test your method by creating a few sample mixtures of isotopes with the sim and see if your method correctly predicts the average atomic mass of that sample from only the atomic masses of the isotopes and the quantity of each isotope. Use the table below to track your progress.

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Atomic mass and quantity of *each* isotope | Average atomic mass  of sample  (calculate yourself) | Average atomic mass of sample (from simulation) |
|  |  |  |  |
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